BRAKE CYLINDERS

AP SECTION 10

CLAYTON DEWANDRE Cº Lᵀᴰ

● TITANIC WORKS ••• LINCOLN ••• ENGLAND ●

Telegrams "Titanic Lincoln" *Telephone Lincoln 25272*

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AIR PRESSURE EQUIPMENT

A. P. SECTION 10

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AIR BRAKE CYLINDERS

INTRODUCTION.

Air brake cylinders described in this booklet are termed brake cylinders because they are mostly used in the operation of air pressure brakes. It is, however, important to remember that these cylinders are designed to perform certain work. Thus, although they are used in most cases to apply brakes, cylinders of this general type may on occasion be used satisfactorily for other duties.

DESCRIPTION.

The air brake cylinders are the means of converting the stored energy in the air system to mechanical energy for operation of the actual brake mechanism. All the Clayton Dewandre range of cylinders are of the piston type and Figs. I and 2 show typical cylinder assemblies. The style of construction is common to all units and consists of an alluminium body or cylinder proper on which is incorporated the base or mounting platform and in which is a sliding piston sealed by a " piston ring " of synthetic rubber of special section. The thrust from the piston is carried by a push rod, the outer end of which is attached to the brake cam shaft lever or to some lever in the brake mechanism. Two types of piston are used, the most common being that illustrated in Fig. I where the piston is sufficient in length to guide itself in the cylinder bore and the push rod is spherically jointed to the piston. The other arrangement, as shown in Fig. 2, has a narrow piston attached to the push rod and is so arranged the piston can tilt slightly to accommodate the angular movement arising from the motion of the brake lever. This second type of assembly is generally referred to as the "tilting piston" arrangement.

In order to curtail wear and decrease weight in the spherically jointed piston, this is now being produced in pressed steel. The improved design is strictly interchangeable with the type previously in general use, and incorporates the provision of a felt ring, carried in a piston groove behind the piston seal, which will absorb oil and maintain lubrication of the cylinder walls. The old and new type piston can be compared by referring to Figs. 3 and 4.

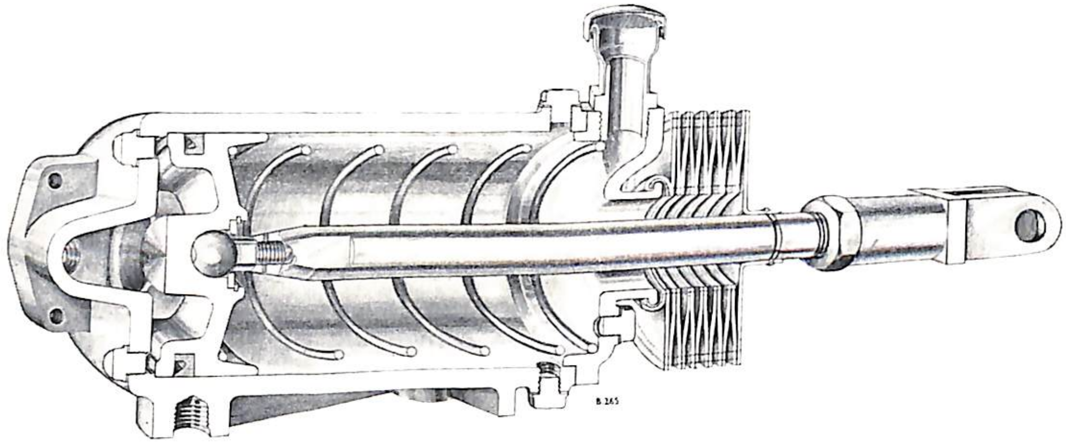

Fig. 1. Sectional illustration of 4.0″ bore x 5.0″ Stroke Brake Cylinder.

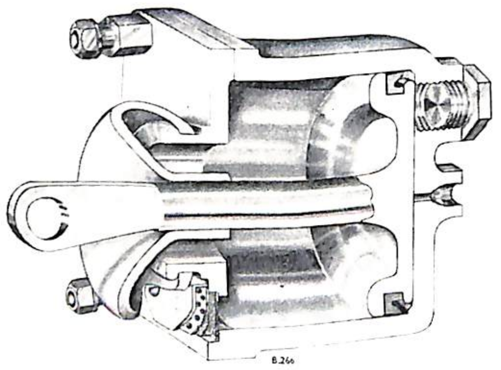

Fig. 2. Sectional illustration of 4.25″ bore x 2.125″ Stroke Brake Cylinder.

There are a considerable variety of cylinder designs available from production and it is naturally beneficial to utilise existing standard designs where possible but sometimes the problems of mounting the cylinders are such that it is not possible to use standard designs and in such cases the Clayton Dewandre Company is quite prepared to produce special designs to solve problems of installation where the quantities involved warrant the manufacturing costs.

The standard range of cylinders are all single acting and all deliver their output in the form of a " push " stroke.

The atmospheric side of the piston is vented to atmosphere, in most cases through a small felt filter element to prevent ingress of grit and the felt filter is itself protected against mud and wet by a small cover. The rubber gaiter provides a dust proof cover for the push rod.

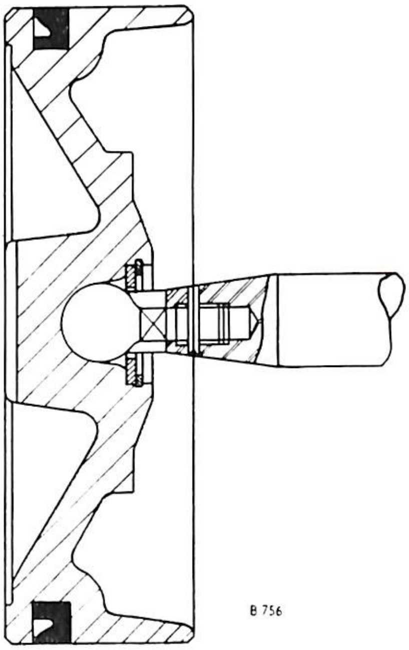

Fig. 3. Original Type Piston.

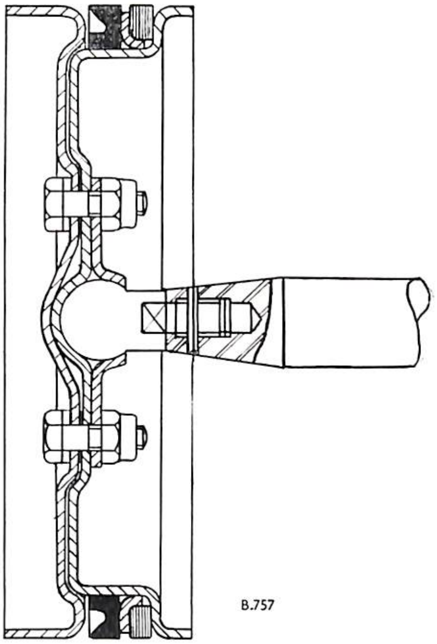

Fig. 4. Pressed Steel Piston.

PERFORMANCE.

Since the brake air pressure is determined by the brake valve and has a maximum value of 80 lbs./sq. inch then any estimate of the work output obtainable from a cylinder is directly related to this fixed maximum brake line pressure. In determining the cylinder lay-out for any particular installation there are two groups of variables, the cylinder bore and stroke and the mechanical ratio between the cylinder and brake. Since the cylinder stroke and the mechanical ratio are inter-related, the simplest basis on which to assess the size of cylinder is that of total work done. Two brake shoe tips which each require an effort of x lbs. through y inches travel have a total work required of 2 xy inch lbs. The cylinder efficiency is normally 90% therefore the swept volume of cylinder necessary is $\dfrac{2\ x.y}{.9 \times 80}$ cubic inches.

The swept volume so obtained can then be compared with the swept volumes of the standard sizes of cylinders available and a suitable cylinder found.

The proportions—bore and stroke—of cylinders available from production are as follows :

Bore	Stroke	Swept Volume	Bore	Stroke	Swept Volume
2-1/2″	2-1/4″	11.05 in^3	4-1/4″	2-1/4″	31.9 in^3
2-5/8″	1″	5.4 in^3	4-1/4″	1-3/4″	24.8 in^3
3″	2-7/8″	20.3 in^3	4-1/2″	2-1/2″	39.8 in^3
3-1/2″	13/16″	7.9 in^3	5″	2-1/2″	49.1 in^3
4″	2-1/2″	31.4 in^3	5-1/2″	2-1/2″	59.4 in^3
4″	3-1/2″	44.0 in^3	6″	2-1/2″	70.7 in^3
4″	5″	62.8 in^3	6″	5.1″	144.3 in^3

If there is no standard cylinder sufficiently close and if on account of mounting difficulties a special cylinder has to be produced, then it is desirable such special cylinders should be of a standard diameter and employ a standard piston.

Piston rod efforts at varying pressures are given in Fig. 5.

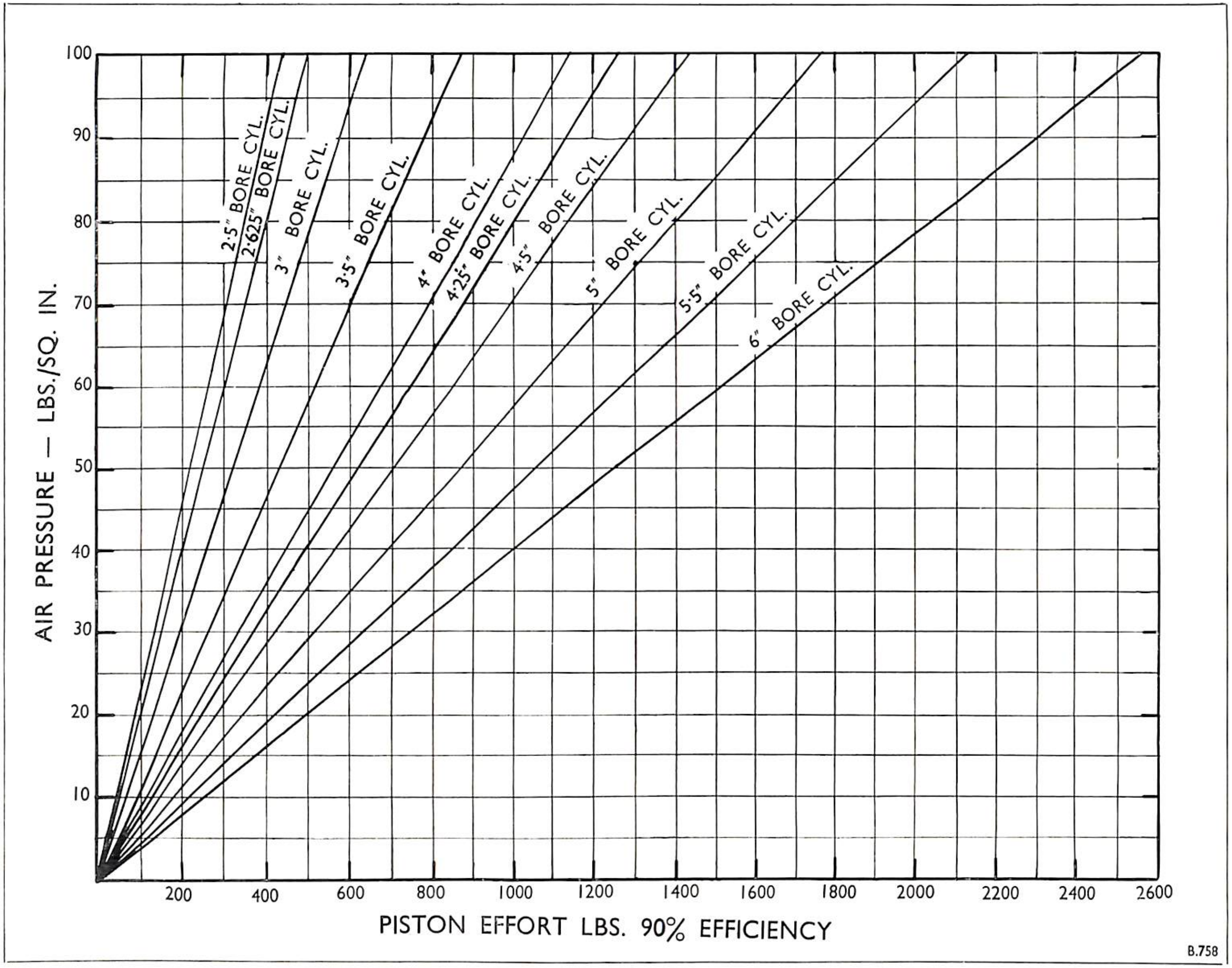

Fig. 5. Performance Chart.

APPLICATION.

Brake cylinders should be mounted as close as possible to the point where the energy is required, i.e. there should be a minimum of mechanical linkage between the cylinder and the work. This is fairly easy of accomplishment on all front brakes as the cylinder is usually mounted upon the brake or steering swivel assemblies and the cylinder effort can be applied directly to the cam shaft lever or to whatever form of movement the brake requires for its operation. In the case of cylinders thus mounted for front wheel cam operated brakes the direction of the piston movement must be such that the inertia effect occasioned by the angular acceleration of the axle bed when the brake is applied, does not add to the effort being delivered by the piston. If this condition is not ensured severe front brake grabbing is extremely likely. Diagrams in Figures 6 and 7 show correct and incorrect mountings of front brake cylinders.

In the case of rear brakes the preferred position of the air cylinders is again on the axle itself but in the case of passenger vehicles this is often impossible due to the offset differential. In such cases cylinders are preferably mounted on a rigid crossmember providing the suspension points for the frame end of the brake linkage between frame and axle.

While it is not possible to publish in this booklet particulars of all available brake cylinders, the drawings given in Figs. 8 to 11 inclusive show those types which are most commonly used.

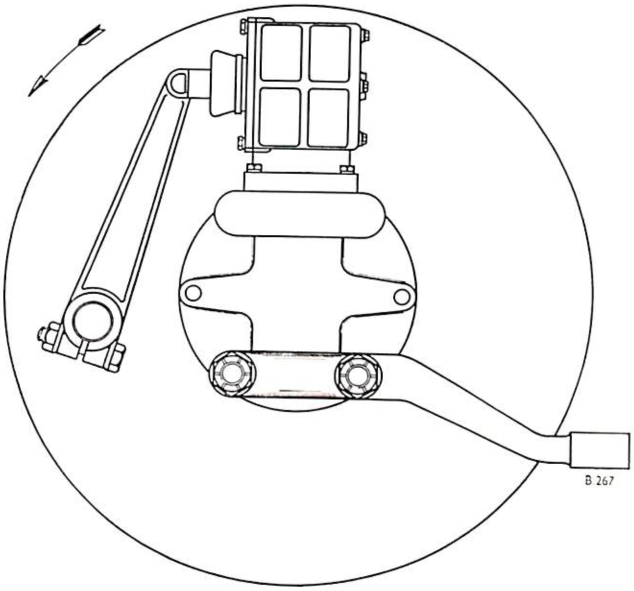

Fig. 6. Diagram showing correct method of mounting Wheel Brake Cylinders.

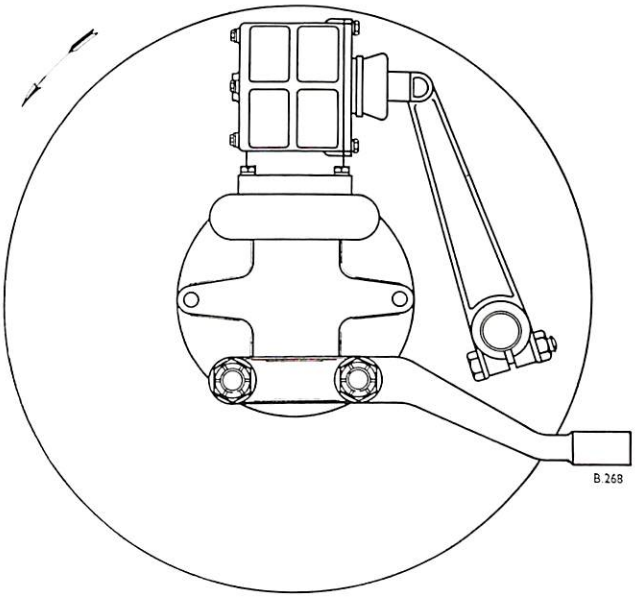

Fig. 7. Incorrect method of mounting Wheel Cylinders.

SERVICE INSTRUCTIONS.

The brake cylinders should be examined at approximately every 40,000 miles. To do this remove the end cover setscrews, taking care the end cover does not fly off by virtue of the piston return spring which it holds in place, remove the gaiter and pull up piston rod complete with piston assembly. Examine the piston glands for damage and replace if necessary, the sealing edges should always be clean and sharp. The gaiters should not be cracked or perished as this will lead to foreign matter gaining access to the inside of the cylinder and damaging the bore or the piston seal.

Should the unit fail to release or show signs of sluggish release :

1. Examine the breather for obstruction ; if the felt pad and perforated plates have become soaked in oil or grease these should be washed out and dried before replacing.
2. Examine the inside of the cylinder for grit and if necessary wash out any deposits and re-grease.
3. Serious external damage, such as a dented cylinder, is best dealt with by replacement of the complete unit.

In the case of pressed steel pistons, unless it is required to replace the piston gland, dismantling of the piston assembly is not advised, but if this is necessary care should be taken to see that the circular joints located between the piston skirt and back plate and the copper washers under the bolt heads are replaced when re-assembling. Failure to do this will result in air leakage through the piston seriously impairing the efficiency of the cylinder.

Great care should be taken when replacing the piston in the cylinder to avoid damage to the piston sealing ring. It is advisable to run a thin feeler blade round the circumference of the sealing ring between the ring and the bore of the cylinder, to obviate any risk of damage to the very fine edge of the ring.

When the reassembly has been completed about $\frac{1}{4}$ of a pint of engine oil should be poured into the pressure side of the cylinder through the air inlet port (1).

Lubricate as above at periods of 20,000 miles.

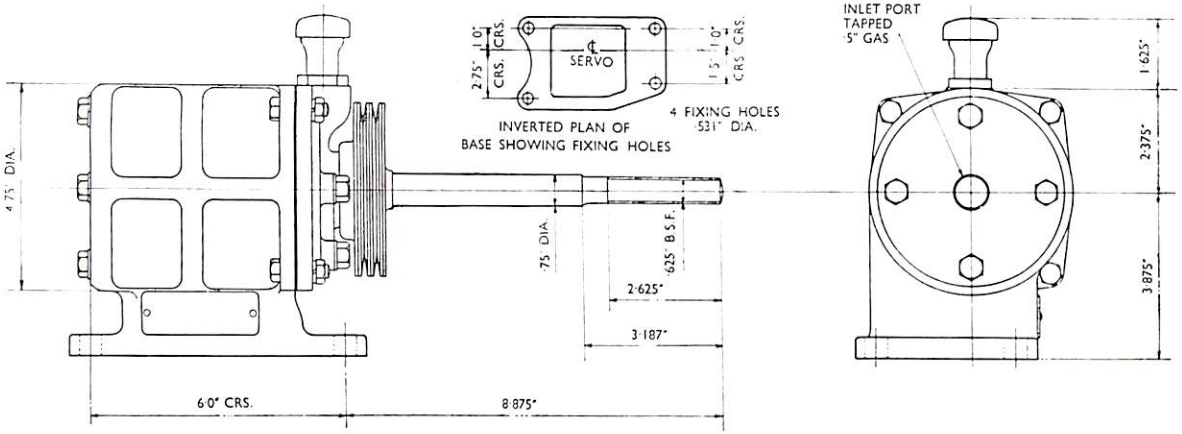

Fig. 8. Typical 4.0″ bore x 2.5″ Stroke Brake Cylinder.

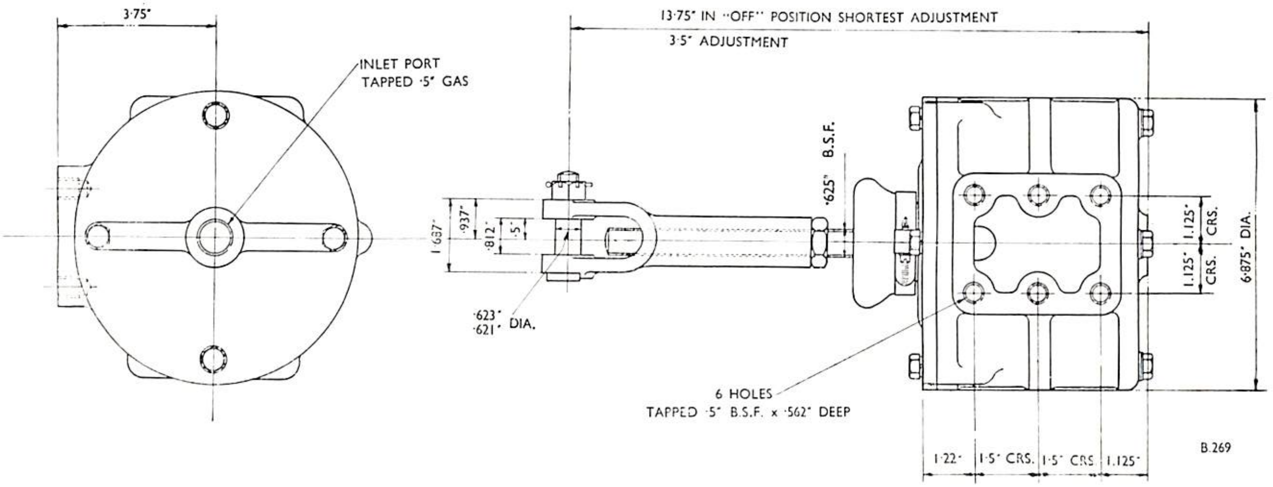

Fig. 9. Typical 6.0″ bore x 2.5″ Stroke Brake Cylinder.

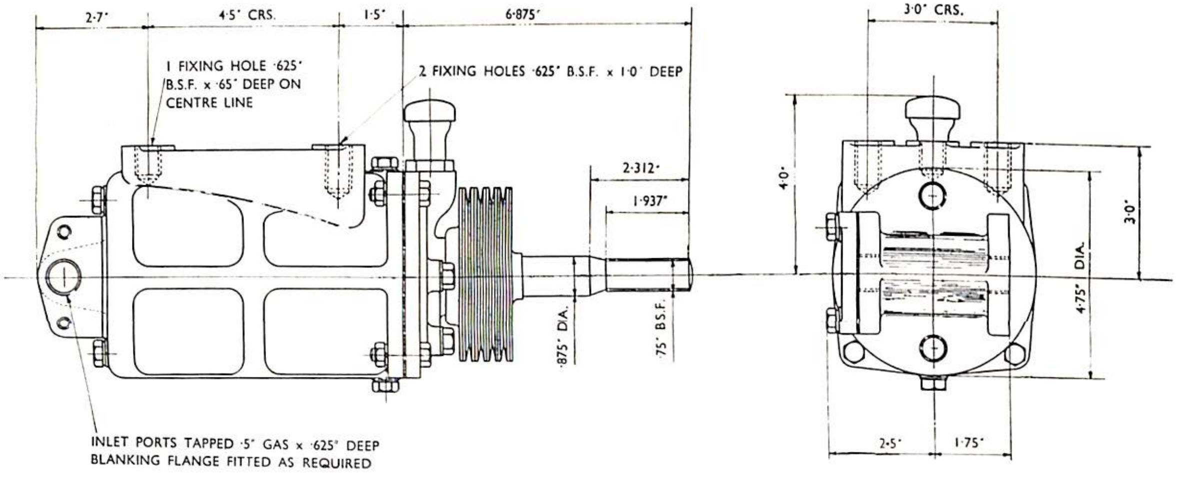
2·7"
4·5" CRS.
1·5"
6·875"
1 FIXING HOLE ·625" B.S.F. x ·65" DEEP ON CENTRE LINE
2 FIXING HOLES ·625" B.S.F. x 1·0" DEEP
2·312"
1·937"
·875" DIA.
·75" B.S.F.
INLET PORTS TAPPED ·5" GAS x ·625" DEEP BLANKING FLANGE FITTED AS REQUIRED
3·0" CRS.
4·0"
3·0"
4·75" DIA.
2·5"
1·75"

Fig. 10. Typical 4.0″ bore x 5.0″ Stroke Brake Cylinder.

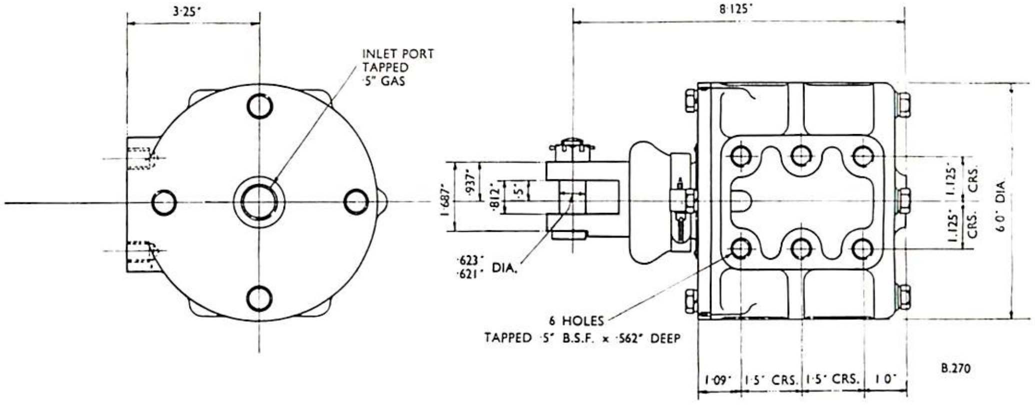

Fig. 11. Typical 5.0″ bore x 2.5″ Stroke Brake Cylinder.

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